

Patent Claims

- 5 1. A purified and isolated polynucleotide, which comprises a DNA sequence coding for a protein GLUT4V85M.
- 10 2. The polynucleotide as claimed in claim 1, which comprises a sequence from any of the following groups:
 - a) a nucleotide sequence according to Seq ID No. 1
 - b) a nucleotide sequence which hybridizes to a sequence of Seq ID No. 1 under stringent conditions and which codes for a protein GLUT4V85M.
- 15 3. The polynucleotide as claimed in claim 1 or 2, wherein the protein GLUT4V85M has an amino acid sequence according to Seq ID No. 2.
- 20 4. The polynucleotide as claimed in claims 1 to 3, in which the coding region for the protein GLUT4V85M is operationally linked to a promotor.
- 25 5. The polynucleotide as claimed in claim 1 to 4, which can be replicated in a yeast cell.
6. The polynucleotide as claimed in claim 5, which can be used to express a protein in a yeast cell.
- 25 7. A yeast cell from *Saccharomyces cerevisiae*, wherein all glucose transporters are no longer functional and which contains no functional *Erg4* protein.
- 30 8. A yeast cell from *Saccharomyces cerevisiae*, wherein all glucose transporters are no longer functional and which contains no functional *Fgy1* protein and no functional *Erg4* protein.
9. The yeast cell as claimed in claim 7 or 8, wherein the *ERG4* gene is completely or partially deleted.

10. The yeast cells as claimed in claim 7, as deposited as *Saccharomyces cerevisiae* DSM 15187.

5 11. The yeast cells as claimed in claim 8 or 9, as deposited as *Saccharomyces cerevisiae* DSM 15184.

12. The use of a yeast cell as claimed in claims 15 to 18 for expressing a mammalian GLUT1 protein or GLUT4 protein.

10 13. The use as claimed in claim 12, for expressing a human GLUT4 protein or a human GLUT1 protein.

15 14. The yeast cell as claimed in claim 7, comprising a polynucleotide as claimed in claims 1 to 6.

15. The yeast cell as claimed in claim 14, comprising a protein GLUT4V85M.

20 16. The yeast cell as claimed in claim 14 and/or 15, as deposited as *Saccharomyces cerevisiae* DSM 15185.

17. A process of preparing a yeast cell as claimed in claims 14 to 16, which comprises the steps:

- a) providing a yeast cell as claimed in claim 7,
- b) providing a polynucleotide as claimed in claim 5 or 6,
- c) transforming the yeast cell as claimed in a) with the polynucleotide as claimed in b),
- d) selecting a transformed yeast cell,
- e) where appropriate, expressing a protein GLUT4V85M.

30 18. The yeast cell as claimed in claim 8 or 9, comprising a polynucleotide as claimed in claims 1 to 6.

19. The yeast cells claimed in claim 18, comprising a protein GLUT4V85M.

20. The yeast cell as claimed in claim 18 and/or 19, deposited as *Saccharomyces cerevisiae* DSM 15186.

- 5 21. A process of preparing a yeast cell as claimed in claims 18 to 20, which comprises the steps:
- a) providing a yeast cell as claimed in claim 8 or 9,
 - b) providing a polynucleotide as claimed in claim 5 or 6,
 - c) transforming the yeast cell as claimed in a) with the polynucleotide as claimed
10 in b),
 - d) selecting a transformed yeast cell,
 - e) where appropriate, expressing a protein GLUT4V85M.

22. A yeast cell whose glucose transporters in their entirety are no longer
15 functional, comprising a polynucleotide as claimed in claims 1 to 6.

23. The yeast cell as claimed in claim 22, comprising a protein GLUT4V85M.

24. The yeast cell as claimed in claim(s) 22 and/or 23, deposited as
20 *Saccharomyces cerevisiae* DSM 15188.

25. A process of preparing a yeast cell as claimed in claims 22 to 24, which comprises the steps:
- a) producing a yeast cell whose glucose transporters in their entirety are no
25 longer functional,
 - b) providing a polynucleotide as claimed in claim 5 or 6
 - c) transforming the yeast cell as claimed in a) with the polynucleotide as claimed
in b)
 - d) selecting a transformed yeast cell,
 - e) where appropriate, expressing a protein GLUT4V84M.
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26. A protein having the functional activity of a glucose transporter, which is encoded by a polynucleotide sequence as claimed in any of claims 1 to 3.

27. The protein as claimed in claim 13, comprising an amino acid sequence according to Seq. ID No. 2.

28. A method for identifying a compound which stimulates the activity of a GLUT4 protein, which comprises the steps:

- a) providing a yeast cell as claimed in one or more of claims 14 to 17,
- b) providing a chemical compound,
- c) contacting the yeast of a) with the chemical compound of b),
- d) determining glucose uptake by the yeast of c),
- 10 e) relating the detected value of the glucose uptake of d) to the detected value of glucose uptake in a yeast cell as claimed in a) which is not contacted with a chemical compound as claimed in b), with a compound which causes an increase in the amount of glucose taken up in the yeast as claimed in d) stimulating the activity of said GLUT4 protein.

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29. A pharmaceutical comprising a compound, which is identified by means of a method as claimed in claim 28, and additives and excipients for formulating a pharmaceutical.

20 30. The use of a compound which has been identified by means of a method as claimed in claim 28 for preparing a pharmaceutical for the treatment of type I and/or II diabetes.

25 31. A method for identifying a compound inhibiting the corresponding protein of the Fgy1 gene, which comprises the steps:

- a) providing a yeast cell as claimed in one or more of claims 7 to 10 which contains a GLUT 4 protein,
- b) providing a chemical compound
- c) contacting the yeast of a) with the chemical compound of b),
- 30 d) determining glucose uptake by the yeast of c),
- e) relating the detected value of the glucose uptake of d) to the detected value of glucose uptake in a yeast cell as claimed in a) which is not contacted with a chemical compound as claimed in b), with a compound which causes an

increase in the amount of glucose taken up in the yeast as claimed in d) stimulating the activity of a protein Fgy1.

32. A pharmaceutical comprising a compound which has been identified by means
5 of a method as claimed in claim 31, and additives and excipients for formulating a pharmaceutical.

33. The use of a compound which has been identified by means of a method as
claimed in claim 31 for preparing a pharmaceutical for the treatment of diabetes.

10 34. A method for identifying a compound which inhibits the protein encoded by the ERG4 gene, which method comprises the steps:

- a) providing a yeast cell as claimed in one or more of claims 22 to 25,
 - b) providing a chemical compound
 - c) contacting the yeast of a) with the chemical compound of b),
 - d) determining glucose uptake by the yeast of c),
 - e) relating the detected value of the glucose uptake of d) to the detected value of glucose uptake in a yeast cell as claimed in a) which is not contacted with a chemical compound as claimed in b), with a compound which causes an increase in the amount of glucose taken up in the yeast as claimed in d)
- 15 inhibiting the activity of a protein Erg4.

20 35. A pharmaceutical comprising a compound which has been identified by means of a method as claimed in claim 34, and additives and excipients for formulating a pharmaceutical.

25 36. The use of a compound which has been identified by means of a method as claimed in claim 34 for preparing a pharmaceutical for the treatment of diabetes.